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Environmental Protection Agency
Office of Transportation and Air Quality
National Vehicle and Fuel Emissions Laboratory
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Smoke Meter Calibration

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NVFEL Reference Number

028

Implementation Approval

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Revision Description

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1. Purpose

The purpose of this procedure is to outline the steps required to perform the annual calibration of the smoke meter, with the AVL-415 Variable Sampling Smoke Meter, in the Advanced Testing Group (ATG) sites

2. Test Procedure

100

101 At the AVL Variable Sampling Smoke Meter, remove top cover.

102 Remove the 5 screws of the side panel with the green controller card.

103 Open the side, like a door, and on the inside board, at the location of J9, remove the blue cover jumper from pins 1-8. See arrow in Figure 1.

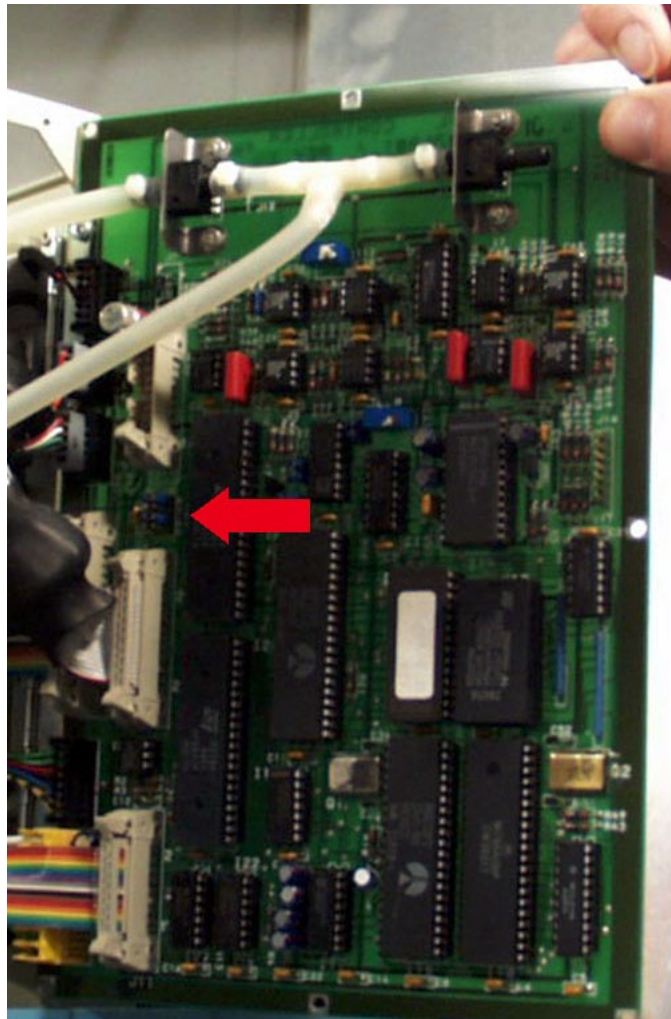


Figure 1
Side panel of Smoke Meter

- 104 At the MTS-PowerTek Instrument Controller, scroll down with the arrow and highlight “TEMP CAL”. See Figure 2.

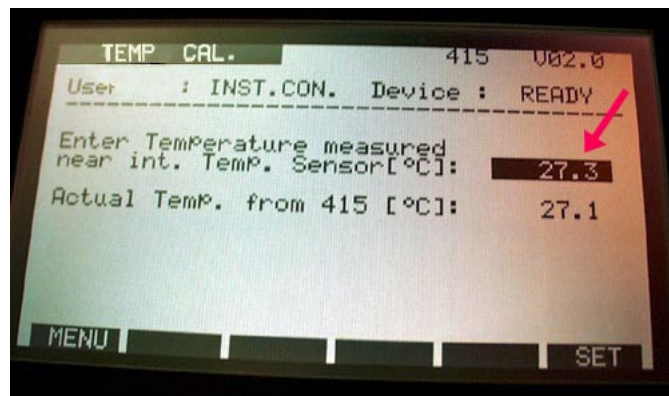


Figure 2
“TEMP CAL.” Screen

- 105 Hit “Execute”.
- 106 Enter the current temperature near the Smoke Meter. See arrow in Figure 2.
- 107 At the Instrument Controller, set the temperature near the Smoke Meter by pressing “F6” for “SET”.
- 108 Enter the temperature by pressing “F6” to “ENTER”.
- 109 Press “F2” to “SAVE”.
- 110 Return to the menu and highlight “VOLUME CAL”.
- 111 Press “F6” to “EXECUTE”.

- 112 Open the front panel of the Smoke Meter, and set the mode selector switch to “Operating Mode 8”. See Figure 3.



Figure 3
Front of Smoke Meter

- 113 In the interior of the Smoke Meter, change the exhaust filter and sampler filter units. See Figures 4 and 5 for sampler filter unit and its locations.



Figure 4
Sampler filter unit

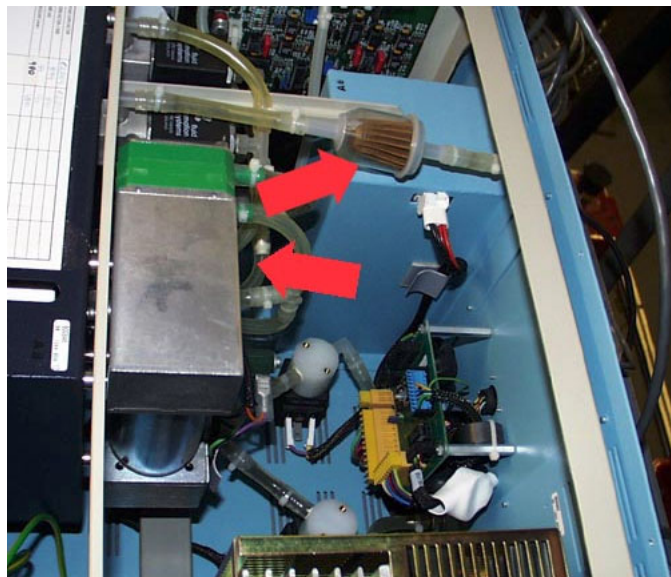


Figure 5
Locations of filter units

- 114 At the back of the AVL 415 Smoke Meter, connect the sample hose to Probe 1 found at the bottom of the back panel. See Figure 6.

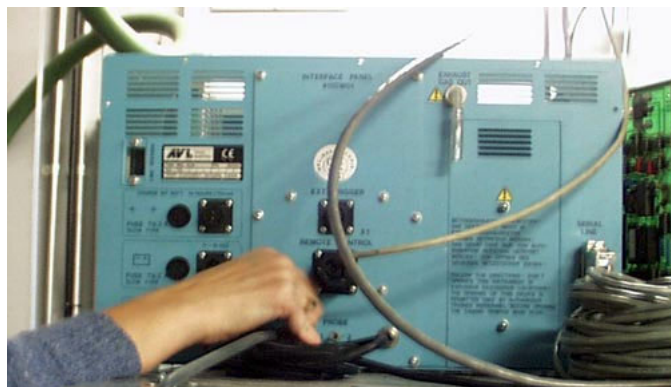


Figure 6
Back of Smoke Meter

- 115 Connect the sample hose to the top of the AVL 4085 Volume Tester. See #1 arrow in Figure 7.



Figure 7
Volume Tester

- 116 Begin the conditioning of the tube of the Volume Tester by filling the cup of the volume Tester halfway with “deconex” or other appropriate fluid. See the #2 arrow in Figure 7 for cup.
- 117 Lower the glass tube, by adjusting the screw found at the back of the Volume Tester, so that its rim touches the liquid in the cup.
- 118 At the Smoke Meter, hit the “START” button. See arrow in Figure 3 for START button.
- 119 At the Volume Tester, condition the tube several times, by repeating the procedure of pressing the START button and watching for the rising bubble.

- 120 When a single bubble rises to the upper part of the tube, note the highest number it reaches. See the #3 arrows in Figure 7.
- 121 Record the number the bubble reaches by entering it on the MTS PowerTek Instrument Controller “VOLUME CAL” in the field titled “Enter the external measured Volume [ml]”. See arrow in Figure 8.

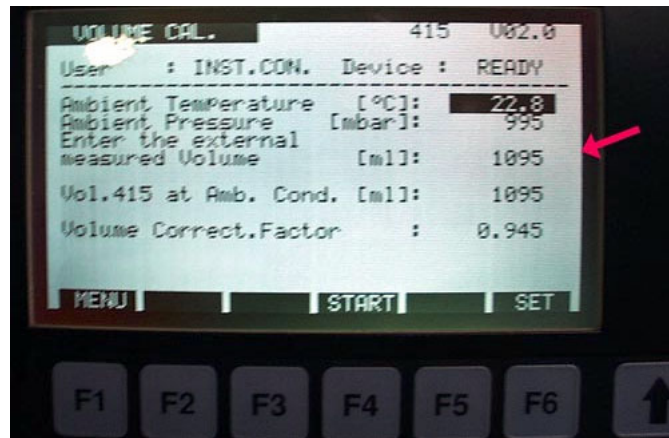


Figure 8
“VOLUME CAL.” screen

- 122 Hit “ENTER”.
- 123 Replace the blue cover jumper on pins 8-1-8 at J-9 on the inside board of the side. See Figure 1.
- 124 Open the front panel of the Smoke Meter and set the mode selector switch back to its original setting of “0 Zero” from “Operating Mode 8”.
- 125 Re-connect the sample hose.

3. Acceptance Criteria

- 3.1 The dead volume adjustment range must be from 0 to 2000 ml. The default setting is 44 ml.
- 3.2 The ambient pressure adjustment range must be from 100 to 2000 mbar. The default is 980 mbar.
- 3.3 The temperature correction factor used to calibrate the temperature sensor must have an adjustment range of 0 to 65535. The default setting is 62392.
- 3.4 The volume correction factor used to calibrate the volume measurement must have an adjustment factor of 0.01 to 32. The default setting is 1.